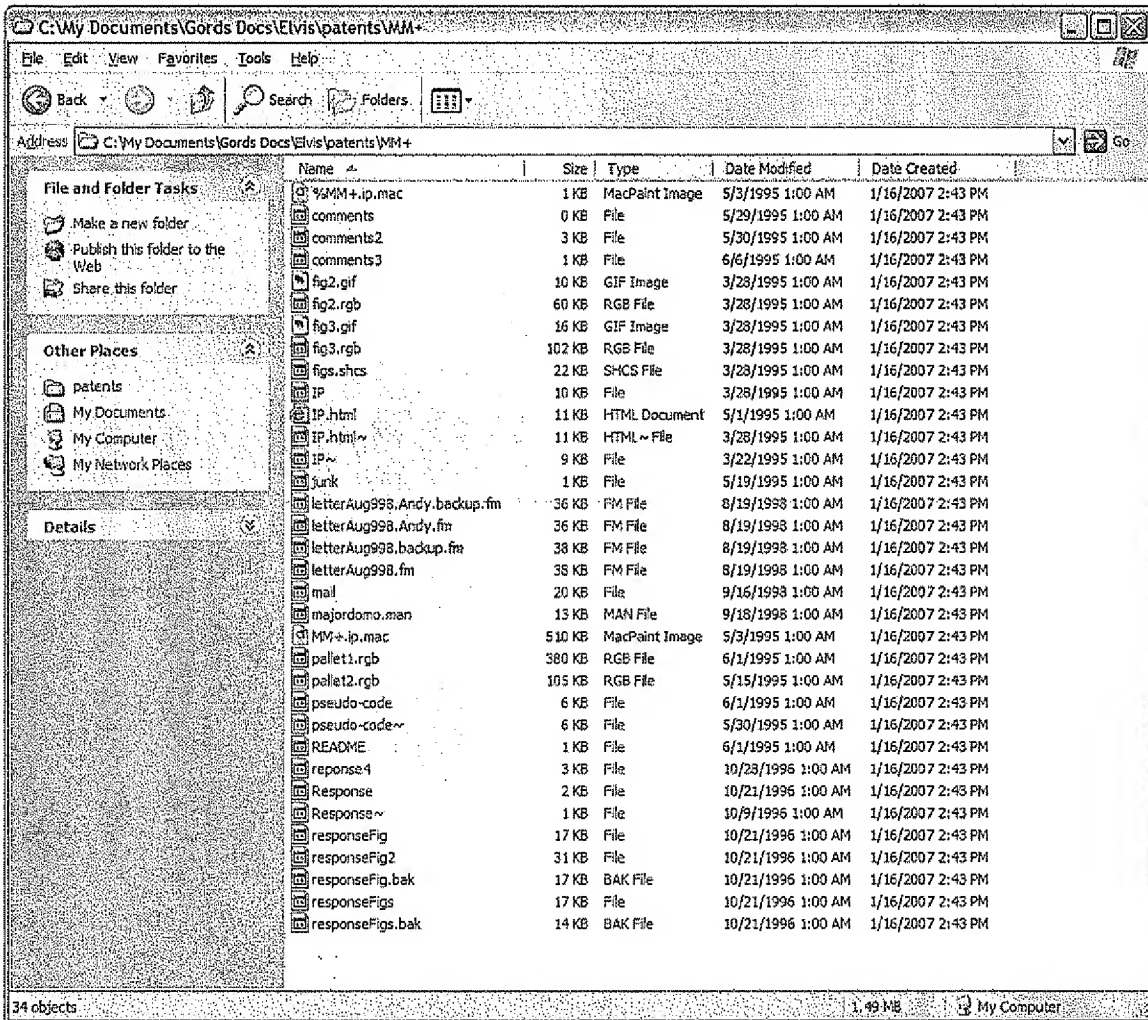


# ATTACHMENT B



# Invention Proposal

*Inventor*



Gordon Kurtenbach

*Descriptive Title*

A Combination of Marking Menus and Linear Menus

*A brief summary of the invention. Indicate the feature which are new.*

Marking menus is a pop up menu technology that displays menu items in a circle, around the cursor whereas traditional menus display menu items in a linear fashion, for example, from top to bottom. Because of this difference, item selection can be performed more rapidly with marking menus than with linear menus. For example, a user can select from marking menus by "flicking" the cursor in the direction of a desired menu item. Thus the user does not have to wait for the menu to be displayed to select from it. However, as the number of items in a marking menus increases, rapid selection without popping up the menu becomes difficult because the angular difference between menu items becomes small and difficult for the user to articulate. To combat this problem, the number of items in a marking menus is generally limited to eight or less. We propose an invention which combines marking menus and linear menus in the same display such that the number of items can be increased beyond eight items while still permitting rapid selection for the first eight items in the menu. This invention makes the replacement of traditional linear menus with marking menus much more simple.

*A more detailed description of the invention, including advantages, the problems solved by the invention, and how each problem is solved. Indicate the current methods used to solve the problems and the deficiencies of these methods. Include sketches, drawings, notebook pages, memos, or photos as appropriate.*

## Introduction

Menus selection in modern user interfaces is a fundamental and frequently used operation. In general, the length of time it takes to select from a menu is small (seconds or fractions of second). However, because menu selection is high frequency operation, reducing the time involved in selecting from a menu can result in significant time savings in the overall time it takes to accomplish a larger task. It is for this very reason that menu selection speed up ("accelerator") techniques like "hot keys" and marking menus (Kurtenbach & Buxton, 1991) are popular.

Each accelerator technique has its own advantages and disadvantages. For example, hot keys can select from a large set of menu items, for example, every key on the keyboard can be used as hot key. However, this is at the cost of the user remembering the associations between menu items and keys. Hot keys are also not effective if a user is working on keyboardless system or the user must move between the keyboard and another device while operating the interface (for example, the user may have to move the same hand from the mouse, to the keyboard, and then back to mouse).

Marking is another menu selection acceleration which works as follows. A user presses down on the screen with the pen and waits for a short interval of time (approximately 1/3 second). A radial menu then appears directly under the tip of the pen. A user then highlights an item by keeping the pen pressed

and making a stroke towards the desired item. If the item has no sub-menu, the item can be selected by lifting the pen. If the item does have a sub-menu, it is displayed. The user then continues, selecting from the newly displayed sub-menu. Figure 1 (a) shows an example. Lifting the pen will cause the current series of highlighted items to be selected. The menus are then removed from the screen. At any time a user can indicate "no selection" by moving the pen back to the center of the menu before lifting, or change the selection by moving the pen to highlight another item before lifting. Finally a user can "back-up" to a previous menu by pointing to its center.

The other, faster, way to make a selection without popping up the menu is by drawing a mark. A mark can be drawn by pressing the pen down and immediately moving. The shape of the mark dictates the particular series of items selected from the menu hierarchy. Figure 1 (b) shows an example.



**Figure 3.** How a fourteen item linear menu can be converted to the invention.

The invention has the following disadvantages relative to traditional linear menus. First, the user must pause to display the menu before selecting an item from the linear portion of the menu. This should not be a great disadvantage since these items are by definition supposed to be infrequently used commands. If the position where the menu pops-up is very close the edge of screen there may not be enough room to select some of items from the radial portion of menu using flick. For example, suppose the menu pops up when a user presses the mouse button down right in the top left corner of the screen. At this point there is no room to "flick" the cursor up or to the left to select some of the menu items. In practice, this is not serious problems since there are very few situation where menu is popped up right along the edge of the screen. Also, the amount of room needed for a flick can be very small. Finally, the radial portion of menu represent a grouping of menu items that is based on frequency of selection. In linear menus, items are generally grouped together based on function. Therefore, the conversion to this new menu system might require minor rearrangement of items in a menu. Fortunately, studies indicate that grouping menu items has little value once user become familiar with a menu layout and therefore this disadvantage would not be a serious problem in the long run.

*Names of other know to have worked on this or similar invention:*

none

*Identify any know similar, or related Invention Proposals, patents or publications, Alias or non-Alias commercial products.*

Radial menus, linear menus and marking menus have been disclosed previous in publications.

*Has the invention been built and/or tested?*

Yes.

*Is the invention used in a current product or planned for use in a future product?*

Marking menus are used in StudioPaint V2. We intend to use the invention in future Alias products.

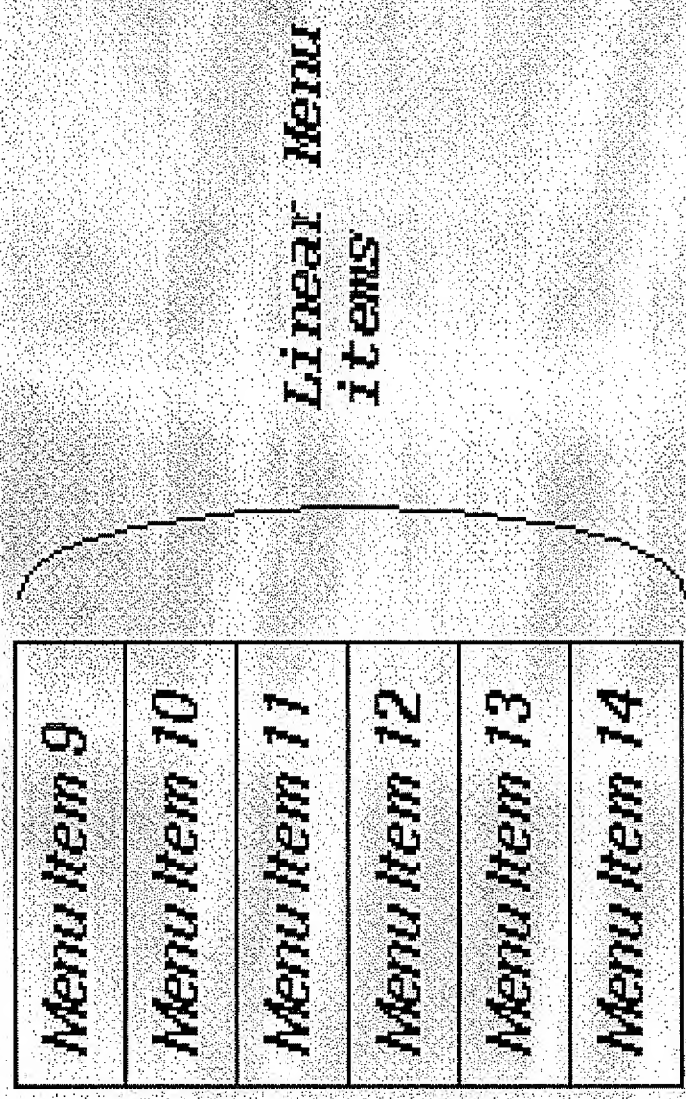
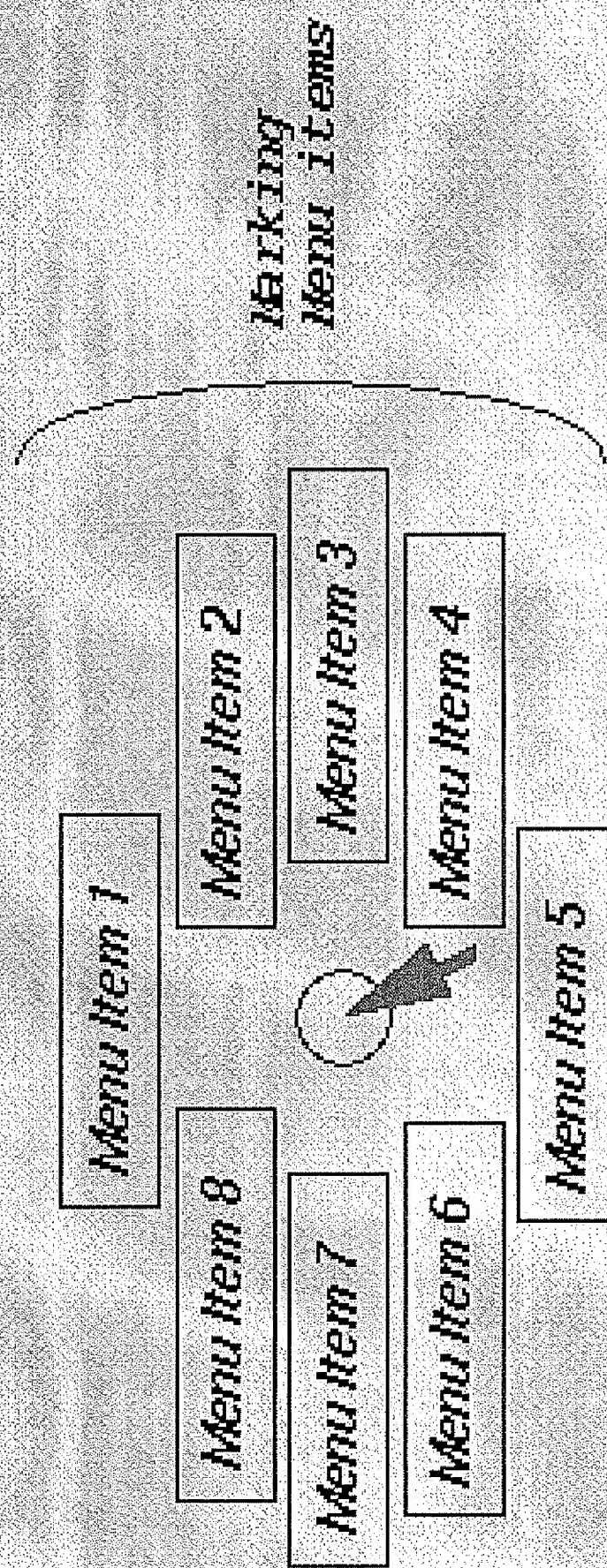
*Indicate the dates of any previous or planned future disclosure external to Alias and identify the type of*

*disclosure (by agreement, demonstration, paper, or presentation, market probe, published article, etc. If convenient, please provide a copy of the agreement, paper or article):*

None planned.

*Source of outside funding for the invention, if any:*

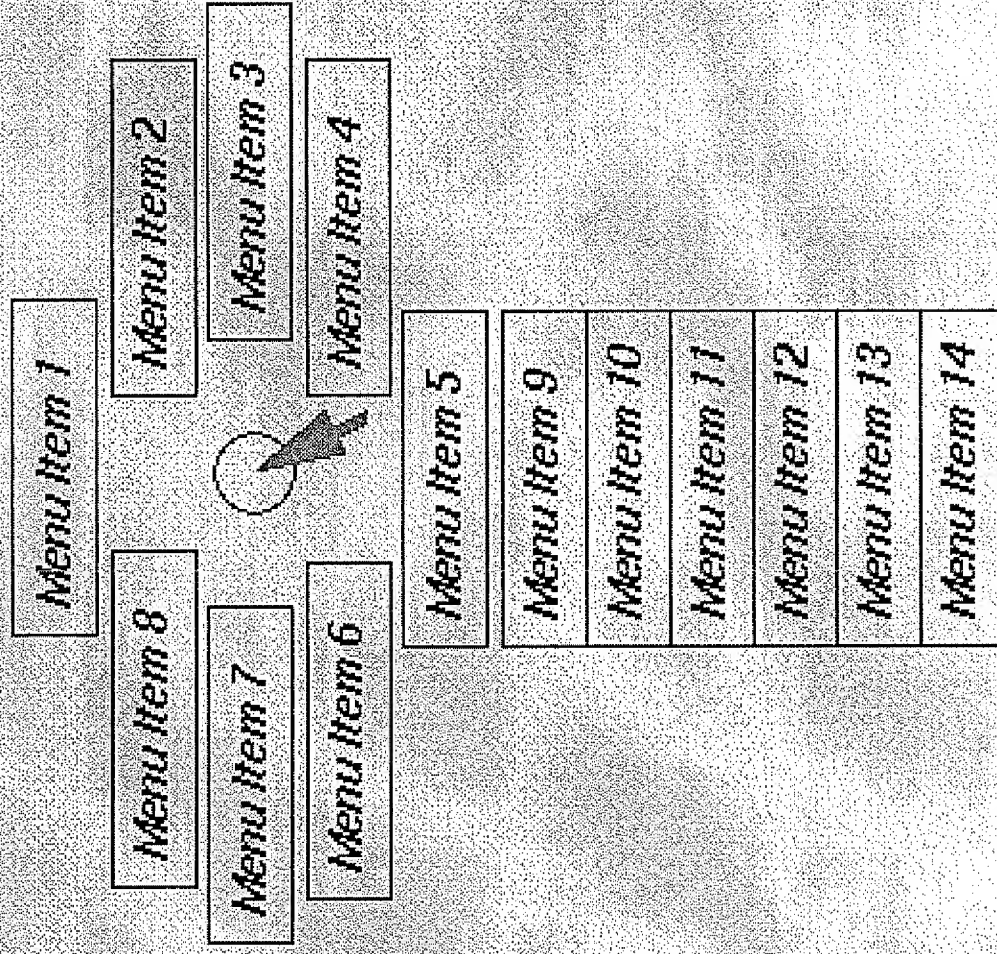
None





Menu Item 1
Menu Item 2
Menu Item 3
Menu Item 4
Menu Item 5
Menu Item 6
Menu Item 7
Menu Item 8
Menu Item 9
Menu Item 10
Menu Item 11
Menu Item 12
Menu Item 13
Menu Item 14

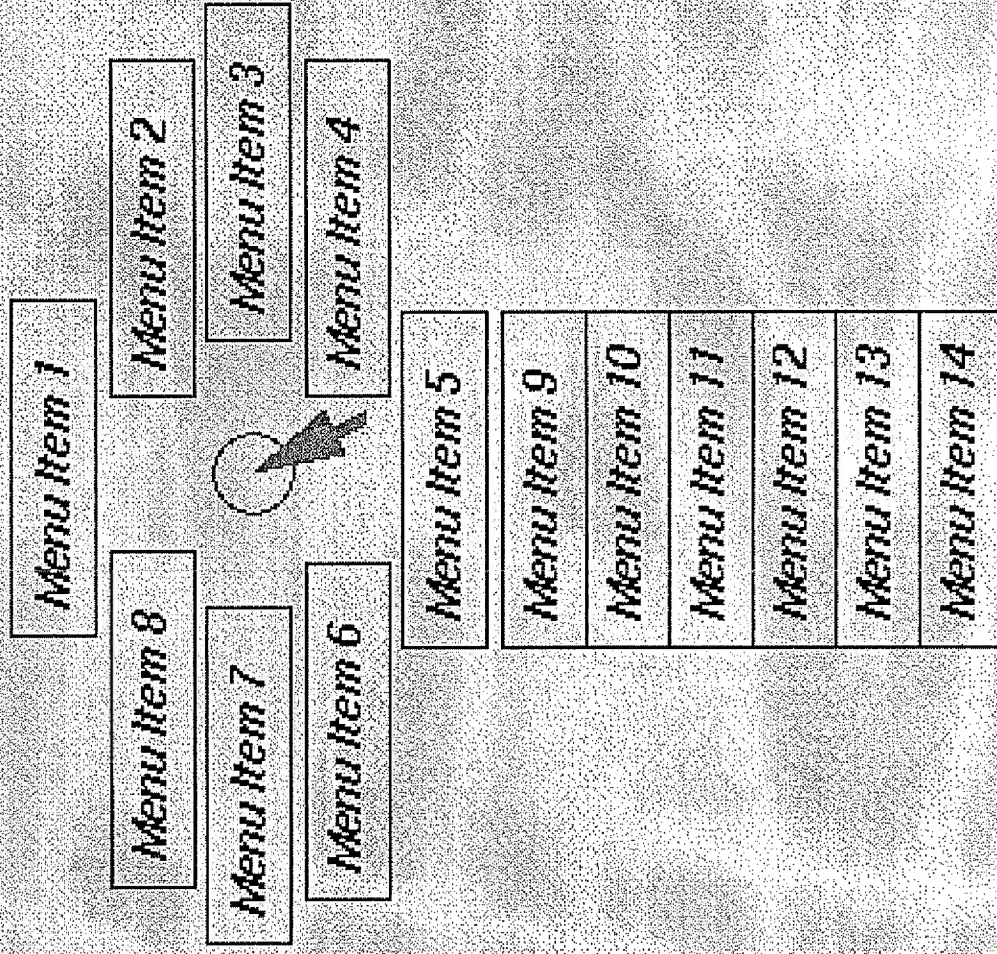
Original  
Linear Menu



Menu in  
combination  
format

Menu Item 1
Menu Item 2
Menu Item 3
Menu Item 4
Menu Item 5
Menu Item 6
Menu Item 7
Menu Item 8
Menu Item 9
Menu Item 10
Menu Item 11
Menu Item 12
Menu Item 13
Menu Item 14

*Original  
Linear Menu*



*Menu in  
combination  
format*



<title>Alias Invention Proposal</title> <h1> Invention Proposal </h1>  
 <P>  
<em> Inventor</em> <P> Gordon Kurtenbach <P> <em>Descriptive Title</em>  
</em> <P> A Combination of Marking Menus and Linear Menus <P> <em>A  
brief summary of the invention. Indicate the feature which are  
new. </em> <P> Marking menus is a pop up menu technology that displays  
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display menu items in a linear fashion, for example, from top to  
bottom. Because of this difference, item selection can be performed  
more rapidly with marking menus than with linear menus. For example,  
a user can select from marking menus by "flicking" the cursor in the  
direction of a desired menu item. Thus the user does not have to wait  
for the menu to be displayed to select from it. However, as the number  
of items in a marking menus increases, rapid selection without popping  
up the menu becomes difficult because the angular difference between  
menu items becomes small and difficult for the user to articulate. To  
combat this problem, the number of items in a marking menus is  
generally limited to eight or less. We propose an invention which  
combines marking menus and linear menus in the same display such that  
the number of items can be increased beyond eight items while still  
permitting rapid selection for the first eight items in the menu.  
This invention makes the replacement of traditional linear menus with  
marking menus much more simple. <P> <em>A more detailed description  
of the invention, including advantages, the problems solved by the  
invention, and how each problem is solved. Indicate the current  
methods used to solve the problems and the deficiencies of these  
methods. Include sketches, drawings, notebook pages, memos, or photos  
as appropriate. </em> <P> Introduction <P> Menus selection in modern  
user interfaces is a fundamental and frequently used operation. In  
general, the length of time it takes to select from a menu is small  
(seconds or fractions of second). However, because menu selection is  
high frequency operation, reducing the time involved in selecting from  
a menu can result in significant time savings in the overall time it  
takes to accomplish a larger task. It is for this very reason that  
menu selection speed up ("accelerator") techniques like "hot keys" and  
marking menus (Kurtenbach & Buxton, 1991) are popular. <P> Each  
accelerator technique has its own advantages and disadvantages. For  
example, hot keys can select from a large set of menu items, for  
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this is at the cost of the user remembering the associations between  
menu items and keys. Hot keys are also not effective if a user is  
working on keyboardless system or the user must move between the  
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any time a user can indicate "no selection" by moving the pen back to

the center of the menu before lifting, or change the selection by moving the pen to highlight another item before lifting. Finally a user can "back-up" to a previous menu by pointing to its center. <P> The other, faster, way to make a selection without popping up the menu is by drawing a mark. A mark can be drawn by pressing the pen down and immediately moving. The shape of the mark dictates the particular series of items selected from the menu hierarchy. Figure 1 (b) shows an example. <P> <img src=

"http://w3.alias.com/~gordo/.icons/MMSmall.gif" <P> <b> Figure 1. </b> Marking Menus allow an items to be selected in two different ways.

Using method (a), radial menus can be sequentially displayed and selections made. Method (b) uses a marking to make the same selection. Method (a) is good when the user is unfamiliar with the menu. Method (b) is good when the user is familiar with the menu and wants to avoid waiting for the display of each menu. <P> Marking menus avoid some of the problems of hot keys. A user does not have to remember association between keys and menu items: they only need to remember the spatial layout of menu items. We have found that users very quickly learn the spatial location of menu items, especially for frequently used commands. Marking menus also do not require a keyboard for operation. However, because human capability is limited in the accuracy in which angles can drawn, the number of menu items in marking menus is generally limited to eight items. <P> The problem is that in many situations modern user interfaces use menu with more than eight items. For example, the number of items in pop-up menus in Alias v6 ranges from 8 to 15 items, with an average of 12.75 items per pop-menu. Higher number of items can be used in marking menus by making the menus hierarchic. In this case rapid menu selection require a zig-zag line rather than just a simple stroke. For example, a 64 item menu can be made up of an eight item menu were each item leads to another eight item submenu. Thus if a UI designer wishes to convert an application which uses linear menus to one which uses marking menus, the designer must convert any menu that takes more than eight items into an hierarchic menu. This conversion process requires extra work and linear menu items may not decompose naturally into hierarchic categories. <P> The invention is variation on the marking menu design which combines marking menus and linear menus such that converting linear menus into marking menu does not require the decomposition of menu items into categories. In the invention the first eight items of the linear menu are mapped directly to marking menu. The addition (the "overflow" items) are mapped to a linear menu. which is display at the same time the marking menu is displayed. Figure 2 shows the invention. Figure 3 shows how a fourteen linear item menu is converted to the technique. <P> <img src= "http://w3.alias.com/~gordo/patents/MM+/fig2.gif" <P> <b> Figure 2. </b> The invention combines a marking menu and linear menu in the same pop-up menu display. <P> This invention has the following advantages. First, as stated before conversion of linear menus this format is simple: no decomposition into hierarchic categories is needed and more that eight item per menu can be used. Second, accelerated selection can be performed on the first eight items in the menu (by drawing a mark at an angle). If the eight most frequently used items in a menu are placed in these first eight menu items, time saving can be realized over traditional linear menus. Third, because some of the items in the menu are laid out side by side as opposed to top to bottom, the overlall height of menu is reduced. Finally, this type of menu takes up the same type screen space as tradition linear

menus and therefore this new menu can be displayed at the same location as tradition linear menus (for example, the menu can be pop-up or pop-down etc.).

<P>

<img src=

"http://w3.alias.com/~gordo/patents/MM+/fig3.gif">

<P>

<b> Figure 3. </b> How a fourteen item linear menu can be converted to the invention.

<P> The invention has the following disadvantages relative to traditional linear menus. First, the user must pause to display the menu before selecting an item from the linear portion of the menu. This should not be a great disadvantage since these items are by definition supposed to be infrequently used commands. If the position where the menu pops-up is very close the edge of screen there may not be enough room to select some of items from the radial portion of menu using flick. For example, suppose the menu pops up when a user presses the mouse button down right in the top left corner of the screen. At this point there is no room to "flick" the cursor up or to the left to select some of the menu items. In practice, this is not serious problems since there are very few situation where menu is popped up right along the edge of the screen. Also, the amount of room needed for a flick can be very small. Finally, the radial portion of menu represent a grouping of menu items that is based on frequency of selection. In linear menus, items are generally grouped together based on function. Therefore, the conversion to this new menu system might require minor rearrangement of items in a menu. Fortunately, studies indicate that grouping menu items has little value once user become familiar with a menu layout and therefore this disadvantage would not be a serious problem in the long run.

<P>

<em>Names of other know to have worked on this or similar invention:

</em>

<P> none

<P>

<em>Identify any know similar, or related Invention

Proposals, patents or publications, Alias or non-Alias commercial products. </em>

<P>

Radial menus, linear menus and marking menus have been disclosed previous in publications.

<P>

<em>Has the invention

been built and/or tested? </em>

<P>

Yes.

<P>

<em>Is the invention

used in a current product or planned for use in a future product?

</em>

<P>

Marking menus are used in StudioPaint V2. We intend to use the invention in future Alias products.

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paper, or presentation, market probe, published article, etc. If convenient, please provide a copy of the agreement, paper or article):

</em>

<P>

None planned.

<P>

<em>Source of outside funding for the invention, if any: </em>

<P>

None



Invention Proposal

Inventor

Gordon Kurtenbach

Descriptive Title

An extension to marking menus to increase the number of menu items

A brief summary of the invention. Indicate the feature which are new.

Marking menus is a pop up menu technology that displays menu items in a circle, around the cursor whereas traditional menus display menu items in a linear fashion, for example, from top to bottom. Because of this difference item selection can be performed more rapidly with marking menus than with linear menus. For example, a user can select from marking menus by "flicking" the cursor in the direction of a desired menu item. Thus the user does not have to wait for the menu to be displayed to select from it. However, as the number of items in a marking menu increases, rapid selection without popping up the menu becomes difficult because the angular difference between menu items becomes small and difficult for the user to articulate. To combat this problem, the number of items in a marking menu is generally limited to eight or less. We propose an invention which combines marking menus and linear menus in the same display such that the number of items can be increased beyond eight items while still permitting rapid selection for the first eight items in the menu. This invention makes the replacement of traditional linear menus with marking menus much more simple.

A more detailed description of the invention, including advantages, the problems solved by the invention, and how each problem is solved. Indicate the current methods used to solve the problems and the deficiencies of these methods. Include sketches, drawings, notebook pages, memos, or photos as appropriate.

Introduction

Menu selection in modern user interfaces is a fundamental and frequently used operation. In general, the length of time it takes to select from a menu is small (seconds or fractions of second). However, because menu selection is high frequency operation, reducing the time involved in selecting from a menu can result in significant time savings in the overall time it takes to accomplish a larger task. It is for this very reason that menu selection speed up ("accelerator") techniques like "hot keys" and marking menus (Kurtenbach & Buxton, 1991) are popular.

Each accelerator technique has its own advantages and disadvantages. For example, hot keys can select from a large set of menu items, for example, every key on the keyboard can be used as hot key. However, this is at the cost of the user remembering the associations between menu items and keys. Hot keys are also not effective if a user is working on keyboardless system or the user must move between the keyboard and another device while operating the interface (for

example, the user may have to move the same hand from the mouse, to the keyboard, and then back to mouse).

Marking is another menu selection acceleration which works as follows.

A user presses down on the screen with the pen and waits for a short interval of time (approximately 1/3 second). A radial menu then appears directly under the tip of the pen. A user then highlights an item by keeping the pen pressed and making a stroke towards the desired item. If the item has no sub-menu, the item can be selected by lifting the pen. If the item does have a sub-menu, it is displayed. The user then continues, selecting from the newly displayed sub-menu. Figure 1 (a) shows an example. Lifting the pen will cause the current series of highlighted items to be selected. The menus are then removed from the screen. At any time a user can indicate "no selection" by moving the pen back to the center of the menu before lifting, or change the selection by moving the pen to highlight another item before lifting. Finally a user can "back-up" to a previous menu by pointing to its center.

The other, faster, way to make a selection without popping up the menu is by drawing a mark. A mark can be drawn by pressing the pen down and immediately moving. The shape of the mark dictates the particular series of items selected from the menu hierarchy. Figure 1 (b) shows an example.

Marking menus avoid some of the problems of hot keys. A user does not have to remember association between keys and menu items: they only need to remember the spatial layout of menu items. We have found the user very quickly learn the spatial location of menu items, especially for very frequently used commands. Marking menus also do not require a keyboard for operation. However, because human capability is limited in the accuracy in which angles can drawn, the number of menu items in marking menus is generally limited to eight items.

The problem is that in many situations modern user interfaces use menu with more than eight items. For example, the number of items in pop-up menus in alias v6 ranges from eight to 15 items, with an average of 12.75 items per pop-menu. Higher number of items can be used in marking menus by making the menus hierarchic. In this case rapid menu selection require a zig-zag line rather than just a simple stroke. For example, a 64 item menu can be made up of an eight item menu where each item leads to an eight item submenu. Thus if a designer wishes to convert an application which uses linear menus to one which uses marking menus, the designer must convert any menu that takes more than eight items into an hierarchic menu. This conversion process required extra work and linear menu items may not decompose naturally into hierarchic categories.

The invention is variation on the marking menu design which combined marking menus and linear menu such that converting linear menus into marking menu does not require decompose menu items into categories. In the invention the first eight item of linear menu are mapped directly to marking menu. The addition (the "overflow" items) are mapped to linear menu. which is display at the same time the marking menu is displayed. Figure 1 shows the invention. Figure 2 shows how

a fourteen linear item menu is converted to the technique.

This invention has the following advantages. First, as stated before conversion of linear menus this format is simple: no decomposition into hierarchic categories is needed and more than eight items per menu can be used. Second, accelerator selection can be performed on the first eight items in the menu. If the eight most frequently used items in a menu are placed in these first eight menu items, time saving can be realized over traditional linear menus. Third, because some of the items in the menu are laid out side by side as opposed to top to bottom, the overall height of menu is reduced. Finally, this type of menu takes up the same type screen space as a traditional linear menu and therefore this menu can be displayed at the same location as traditional linear menus (for example, the menu can be pop-up or pop-down etc.).

The invention has the following disadvantages relative to traditional linear menus. First, the user must pause to display the menu before selecting an item from the linear portion of the menu. This should be a great disadvantage since these items are by definition supposed to be low frequency commands. If the position where the menu pops-up is very close to the edge of screen there may not be enough room to select some of the items from the radial portion of the menu using flick. For example, suppose the menu pops up when a user presses the mouse button down right in the top left corner of the screen. At this point there is no room to "flick" the cursor up or to the left to select some of the menu items. In practice, this is not a serious problem since there are very few situations where a menu is popped up right along the edge of the screen. Also, the amount of room needed for a flick can be very small. Finally, the radial portion of the menu represents a grouping of menu items that is based on frequency of selection. In linear menus, items are generally grouped together based on function. Therefore, the conversion to this new menu system might require minor rearranging of items in a menu. Fortunately, studies indicate that grouping menu items has little value once a user becomes familiar with a menu layout and therefore this disadvantage would not be a serious problem in the long run.

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None planned.

Source of outside funding for the invention, if any:

None



Invention Proposal

<P>

Inventor

<P>

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<P>

Descriptive Title

<P>

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Each accelerator technique has its own advantages and disadvantages. For example, hot keys can select from a large set of menu items, for example, every key on the keyboard can be used as hot key. However, this is at the cost of the user remembering the associations between menu items and keys. Hot keys are also not effective if a user is working on keyboardless system or the user must move between the keyboard and another device while operating the interface (for

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<P>

The problem is that in many situations modern user interfaces use menus with more than eight items. For example, the number of items in pop-up menus in alias v6 ranges from eight to 15 items, with an average of 12.75 items per pop-menu. Higher number of items can be used in marking menus by making the menus hierarchic. In this case rapid menu selection requires a zig-zag line rather than just a simple stroke. For example, a 64 item menu can be made up of an eight item menu where each item leads to an eight item submenu. Thus if a designer wishes to convert an application which uses linear menus to one which uses marking menus, the designer must convert any menu that takes more than eight items into an hierarchic menu. This conversion process required extra work and linear menu items may not decompose naturally into hierarchic categories.

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The invention is a variation on the marking menu design which combined marking menus and linear menus such that converting linear menus into marking menus does not require decomposing menu items into categories. In the invention the first eight items of a linear menu are mapped directly to a marking menu. The addition (the "overflow" items) are mapped to a linear menu, which is displayed at the same time the marking menu is displayed. Figure 1 shows the invention. Figure 2 shows how

a fourteen linear item menu is converted to the technique.

<P>

This invention has the following advantages. First, as stated before conversion of linear menus this format is simple: no decomposition into hierarchic categories is needed and more than eight items per menu can be used. Second, accelerator selection can be performed on the first eight items in the menu. If the eight most frequently used items in a menu are placed in these first eight menu items, time saving can be realized over traditional linear menus. Third, because some of the items in the menu are laid out side by side as opposed to top to bottom, the overall height of menu is reduced. Finally, this type of menu takes up the same type screen space as a traditional linear menu and therefore this menu can be displayed at the same location as traditional linear menus (for example, the menu can be pop-up or pop-down etc.).

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The invention has the following disadvantages relative to traditional linear menus. First, the user must pause to display the menu before selecting an item from the linear portion of the menu. This should be a great disadvantage since these items are by definition supposed to be low frequency commands. If the position where the menu pops-up is very close to the edge of screen there may not be enough room to select some of the items from the radial portion of the menu using flick. For example, suppose the menu pops up when a user presses the mouse button down right in the top left corner of the screen. At this point there is no room to "flick" the cursor up or to the left to select some of the menu items. In practice, this is not a serious problem since there are very few situations where a menu is popped up right along the edge of the screen. Also, the amount of room needed for a flick can be very small. Finally, the radial portion of the menu represents a grouping of menu items that is based on frequency of selection. In linear menus, items are generally grouped together based on function. Therefore, the conversion to this new menu system might require a minor rearrangement of items in a menu. Fortunately, studies indicate that grouping menu items has little value once a user becomes familiar with a menu layout and therefore this disadvantage would not be a serious problem in the long run.

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<P>

Identify any known similar, or related Invention Proposals, patents or publications, Alias or non-Alias commercial products.

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Radial menus, linear menus and marking menus have been disclosed previously in publications.

<P>

Has the invention been built and/or tested?

<P>

Yes.

<P>

Is the invention used in a current product or planned for use in a future product?

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Marking menus are used in StudioPaint V2. We intended to use the invention in future Alias products.

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Indicate the dates of any previous or planned future disclosure external to Alias and identify the type of disclosure (by agreement, demonstration, paper, or presentation, market probe, published article, etc. If convenient, please provide a copy of the agreement, paper or article):

<P>

None planned.

<P>

Source of outside funding for the invention, if any:

<P>

None